Wisconsin & Michigan Railroad Bridge
(Koss Bridge)
Spanning the Menominee River
between County Trunk Highway "JJ",
Town of Wagner, Marinette County, Wisconsin
and Shakey Lakes Road,
Town of Lake, Menominee County, Michigan

HAER No. WI-60

PHOTOGRAPHS

WRITTEN HISTORICAL AND DESCRIPTIVE DATA

Historic American Engineering Record
National Park Service
U.S. Department of the Interior
Rocky Mountain Regional Office
P.O. Box 25287
Denver, Colorado 80225

HISTORIC AMERICAN ENGINEERING RECORD

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Wisconsin & Michigan Railroad Bridge
(Koss Bridge)

HAER No. WI-60

Location:	Spanning the Menominee River between County Trunk Highway "JJ," Town of Wagner, Marinette County, Wisconsin and Shakey Lakes Road, Town of Lake, Menominee County, Michigan UTM: 585200.2590450 Quad: Swanson, Michigan/Wisconsin
Date of Construction:	October 1894
Contractor:	F. S. Brown & Company Chicago, Illinois
Fabricator:	Unknown
Present Owners:	Marinette County, Wisconsin, and Menominee County, Michigan
Previous Owners:	1894-1918 - Wisconsin & Michigan Railway Company 1918-1938 - Wisconsin & Michigan Railroad Company
Present Use:	Vehicular traffic (1938-present)
Previous Use:	Railway traffic (1894-1938)
Significance:	The Wisconsin & Michigan Railroad Bridge is an example of a pin-connected Pratt through truss, a standard design used during the late 19th century. The bridge is unusual, in that it consists of two unequal spans, one measuring 162 feet and the other 221 feet. The long span may be one of the longest Pratt through trusses in Wisconsin and Michigan. In addition, the bridge is one of only a few extant trusses built before 1900. The history of the railroad bridge documents the development and decline of the logging industry in northern Wisconsin and Michigan.
Historian:	Diane Kromm November 1989

The Wisconsin & Michigan Railroad Bridge spans the Menominee River, the natural boundary line between northern Wisconsin and Michigan. The river flows into Green Bay, Wisconsin, providing access from the Menominee River Valley to Lake Micbigan. The Wisconsin & Michigan Railroad, built in 1894, followed a path roughly parallel with the river.[1] The bridge carried railroad traffic until 1938. For the last 50 years, the single-lane interstate bridge has carried vehicular traffic between Marinette County, Wisconsin, and Menominee County, Michigan (see pages 16-19).

The exploitation of natural resources influenced the economic development of the region and determined transportation patterns. The fur trade initially brought individuals to the area in the 1830s. Two decades later, extensive pine forests attracted individuals who recognized the potential for lumbering. At the same time, the discovery of iron and copper ore in Michigan's upper peninsula prompted other people to work in the developing mining industry. Land and railroad company advertisements tried to lure prospective farmers to the area as the land was cleared, but agriculture remained a small part of the economy until the lumber industry began to decline after the turn of the century.[2]

Lumber and mining industries attracted railroad development to the area. Private companies establisbed temporary railroad lines in the 1850s. The Chicago and Northwestern Railway Company built permanent rail service through the region in 1872. The Cbicago, Milwaukee & St. Paul soon followed.[3] As the agricultural industry developed, residents expressed interest in developing a more convenient road system. The Menominee River restricted travel between Marinette and Menominee counties until 1907, when local officials built three interstate highway bridges across the river. These roads opened up farm land for settlement along both sides of the Menominee River.[4]

Construction – Original Bridge

The Wisconsin & Michigan Railroad Bridge was built in the fall of 1894, the second bridge built at the site during the same year. Because the design was based on overcoming problems inherent in the first structure, it is helpful to look at the construction of the previous bridge to understand why builders made modifications. Unfortunately, a comparison is limited because primary sources do not reveal a description or the specifications of the original bridge.

According to a local newspaper journalist, in December of 1893, railroad company officials had expectations of building a five-span stone bridge across the Menominee River. They anticipated erecting the structure, 60 feet per span, by early spring.[5] Accounts of the actual construction, however, indicate a metal truss was built instead. By mid-February, the piers and abutments were being installed, with completion expected within 30 days. The foundation required over 50 carloads of stone. In mid-March, the metal framework for the bridge arrived from Chicago, strapped to six Chicago & Northwestern Railroad flat cars. Although ice and logs, flowing downriver, caused construction problems for the bridge workers, they finished erecting the bridge by the end of the month.[6] A local journalist lauded the structure as a "splendid piece of work, built on the latest improved bridge plans."[7] Within three weeks, the bridge was in danger of collapsing.

On April 18th, a log jam damaged the bridge and threatened to undermine the foundation. A mass of logs had formed against the south end of the bridge, directing the force of the river to the Michigan side. Although 40 to 50 workers were recruited to keep the cbannel clear between the Michigan abutment and the first pier, the current began to wash away the surrounding bank. Railroad officials attributed the problem to faulty design. With two piers built close together, logs coming down the river could jam at any time, straining the metal truss and eroding the river bottom around the footings. The immediate solution appeared to be reinforcing the Michigan side abutment and putting in a new long span from the abutment to the second pier, providing enougb room for logs to pass unimpeded.[8] Three months later, railroad officials adopted this solution, but rather than alter the existing structure, they chose to replace it with a new two-span truss.

Railroad administrators decided to repair the old bridge, damaged by high water and logs, and move it south to Peshtigo where, with two additional spans, it was to carry the Wisconsin & Michigan Railroad across the Peshtigo River. In early September, a Menominee boiler company, Fernstrum & Fred, was repairing the bridge. It is, bowever, unclear what happened to this structure. In 1895, the railroad company erected a temporary wooden bridge across the Peshtigo River instead of the repaired metal truss. This wooden structure apparently served the railroad until 1907, when an unknown Chicago bridge company erected a permanent metal bridge.[9]

Construction – Wisconsin & Michigan Railroad Bridge

Railroad officials awarded the contract of building the new Wisconsin & Michigan Railroad Bridge to a Cbicago contracting firm, F. S. Brown & Co.. Details of the actual bridge construction are vague, with the manufacturer of the metal truss unidentified in local records. A former employee of the railroad company believed that a McGinnis Construction Company of Chicago built the bridge. There is no evidence, however, in Chicago or Illinois records to indicate that such a company existed.[10] By the end of July, a contract had been let for the piers, with completion required in 90 days. Builders expected the metal truss to be shipped on the new road through Bagley Junction, most likely from Chicago.[11] By the middle of September, the railroad tracks were finished to the bridge and the stone foundation was within 20 weeks of being completed. Workers were erecting the metal truss by the end of the month, a job they expected to complete in 15 days. By early November, trains were running over the Wisconsin & Michigan Railroad Bridge between Ingalls, Michigan, and Peshtigo, Wisconsin.[12]

F. S. Brown & Company

Frederick S. Brown and Frank Ericksen formed F. S. Brown & Co. in 1890 and continued to operate it until 1898. Brown worked as a railroad contractor until several years before his death in 1916. According to Chicago city directories, Ericksen identified his home as Anamosa, Iowa, throughout the 1890s.[13]

It is unknown what company or individual served as contractor for the first bridge. A local newspaper account indicated that the "McCain Bros., Chicago contractors," were responsible for removing the damaged bridge from the river. Since Cbicago city directories do not include a company by this name,

it is likely the reporter was referring to the F. J. McCain Company, a Chicago contracting firm for erecting bridges, buildings, roofs, and viaducts.[14]

Regional Impact

The impact of the bridge on regional development is directly linked to the influence of the railroad. Loggers initially used the Menominee River to transport logs to the saw mills, but as timber harvested along the river dwindled, they needed access from the interior forests to the river. Initially, they used teams of borses, but logging railroads soon surpassed them in efficiency and speed.

In the 1880s, Jobn Bagley, a railroad logger from Chicago, built the Ingalls & White Rapids Railroad in Menominee County to transport logs from lumber camps to a landing on the Menominee River [the future site of the Wisconsin & Michigan Railroad Bridge]. As with most logging railroads, it was a temporary narrow gauge track, operated only as long as forests in the area yielded timber. By the early 1890s, Bagley decided to consolidate this railroad with a larger venture. He proposed building a railroad parallel with the Menominee River Valley {eventually the Wisconsin & Michigan Railroad]. The proposed road would provide access through the heavily forested interior, with a main line and brancb or spur lines to numerous lumber camps. But several factors distinguished this line from previous railroads built in the area. The railroad was to be a permanent line built with standard gauge rails. In addition, this road was to extend the line directly to distribution centers located on Green Bay, at Peshtigo Harbor, and in Menominee and Marinette. From this point, barges were to deliver lumber directly to Chicago markets 300 miles to the south. This route permitted loggers to bypass the river completely.[15]

Bypassing the river eliminated the annual delay of rafting the logs downstream. Previously, loggers in this region had transported logs to the nearest landing on the Menominee River. The timber was stockpiled until the spring, when the water was high enough to raft the logs to saw mills in Menominee and Marinette. From there, the finished lumber was shipped by rail to Chicago. This process meant cut timber migbt not reach the saw mills for three to six months after having been cut. With the new railroad, the delay could be reduced to two days. This transportation system also allowed lumbermen to avoid using other railroads that cbarged exorbitant rail rates.

Eliminating river transportation also allowed individuals to built saw mills farther into the interior. Only unfinisbed timber could be rafted down the river, and, as a consequence, sawmills were concentrated in the Marinette and Menominee area. With the new railroad to transport finished timber, sawmills could form all along the railroad line. The sawmill operations and railroad depots encouraged the development of villages by attracting workers, families, and accompanying businesses.[16] Most of these small villages disappeared wben the railroad stopped operating in the 1930s.

Wisconsin & Michigan Railway Company

To build the railroad, John Bagley acquired the financial support of three Chicago investors attracted to a seemingly profitable venture that would provide a direct link from Chicago to the rich timber and mineral region in the north, by way of the Lake Michigan Car Ferry Transportation Company. The

railroad could also provide the connection for freight shipments between the Soo Road and the transfer boats of Michigan's Toledo, Ann Arbor & Northern Railroad, establishing a transcontinental route (see page 20). The company incorporated in Wisconsin in October 1893; during the same month, the company organized, under the name of Menominee & Northern Railway, in Michigan. Bagley began construction within several months.[17]

The exact location of the route was initially undecided. Railroad administrators eventually chose to locate the southern part of the road on the Wisconsin side of the river for several reasons. This location situated the new railroad centrally between the Chicago & Northwestern on the east and the Chicago, Milwaukee & St. Paul on the west. It ran the line through a heavily-forested region and provided transportation for agricultural goods. In addition, it provided the shortest and most direct connection with Soo Road.[18] As a consequence, a bridge was needed to span the Menominee River. When first built, the railroad extended 60 miles from Peshtigo and Marinette in Wisconsin to Faithorn, Michigan.

Local businessmen saw the railroad as an economic boon to the region. Establishing a link between major railroads, they argued, provided direct access to the Soo Road, opening up new markets and placing rates on parity with Milwaukee and Chicago. Besides attracting industries, they continued, the railroad would allow local farmers to sell their produce directly to markets in Michigan's upper peninsula. Some Chicago businessmen were more skeptical. They believed that the Soo line's new connection would adversely compete with the carrying rates between Chicago and the northwest.[19] As it turned out, neither prediction was accurate.

Decline of the Railroad

By the early 1910s, much of the pine forest was cut over, and the logging industry was declining. The Wisconsin & Michigan Railway Company struggled with financial problems. In 1912, the road fell into receivership. The following year, John Marsh, a Chicago investor, purchased the road after it went bankrupt. Passenger service continued to decline, as the principal riders, logging camp workers, left the area. Marsh eliminated several roadbeds in 1918, including the Peshtigo branch to Peshtigo Harbor, and reorganized the company under the name Wisconsin and Michigan Railroad Company. Despite his efforts, the company continued to operate at a loss. The railroad eventually extended as far north as Iron Mountain, Michigan, but it never penetrated the iron and copper mining region as some investors had anticipated. With the logging industry in decline, the railroad began relying more heavily on linking freight shipments as its primary source of income.[20]

In 1937, the railroad company's board of directors applied to the Interstate Commerce Commission (ICC) for permission to abandon the road. They cited the need for extensive repairs to the roadbed and declining income to justify their action. The road at this time was transporting various materials and products--lumber, forest products, coal, iron, steel, grain--but the amount of freight shipped was steadily declining. Railroad administrators attributed the loss of business to growing competition from the trucking industry. Business and political leaders from the cities of Marinette and Menominee argued that the railroad was vital for commercial, industrial and agricultural interests in the community. Despite their objections, the ICC approved the abandonment in January 1938. The road ceased operations on July 1, 1938.[21]

Conversion to Vehicular Bridge

When the railroad company made arrangements to dispose of its property, the Marinette and Menominee county highway commissions offered to purchase the Wisconsin & Michigan Railroad Bridge. Each county agreed to pay $625.00 for the bridge, plus an additional amount for each approaching right-of-way.[22] By 1938, the local economy was based primarily on agricultural and recreational activity, so the county governments were interested in providing an efficient highway system for farmers and visitors. In less than a month after the railroad officially stopped running, immediate plans were being made to dispose of the bridge rails and convert it to a one-lane motor vehicle traffic bridge. As it does now, the bridge connected County Trunk Highway "JJ" with Shakey Lakes Road. The bridge carried a light volume of local traffic for the next 50 years. Increasing traffic demands have prompted the desire for an improved highway and a new two-lane bridge.[23]

The Wisconsin & Michigan Railroad Bridge still exists after 95 years for at least two reasons. First, the Wisconsin & Michigan Railway Company was a small firm that maintained existing equipment. Larger companies usually upgraded locomotives, increasing loads and speeds that caused railroad bridges to become obsolete, often within a few decades. Second, when the bridge was modified to carry vehicular traffic in the 1930s, it was located on a secondary road with relatively infrequent use.

Bridge Description

The Wisconsin & Michigan Railroad Bridge is a two-span Pratt through truss with pin connections. A 1979 Bridge Inspection Report (see pages 23-35) and Wisconsin Department of Transportation field notes (Bridge No. P-38-905) provide sketches and measurements of the bridge. The total length of the steel structure measures 388 feet. The short span measures 162 feet in length, with five full panels (six vertical posts); the distance between the posts is 23 feet. The long span measures 221 feet in length, with seven full panels (eight vertical posts); the posts are placed 24.5 feet apart. Each span has an overall height of 29 feet, with 18.4 feet vertical clearance. The bridge rests on full retaining abutments and a solid shaft stone pier.

The width of the bridge is 15.6 feet. The roadway consists of 3x12-inch timber planks resting on 8x8-inch ties. The roadway extends 10.3 feet in width inside 4-inch plank curbs. Outside the curb, timber post and wire rope railings line the roadway. The lower laterals extend beneath the two stringers placed 90 inches apart.

The two spans contain similar components. The stringers, identical on both spans, are 32 inches high and 5/8-inch thick. Built-up L sections, secured by rivets with 1-1/2-inch heads, extend the width of the stringers to 10-5/8 inches. The floor beams, identical on both spans, measure 40.5 inches with a 1/2-inch thickness. The built-up L-sections increase the width to 10-1/2 inches.

Although both spans are similar, some sections of the long span incorporate larger members. On the long span, the top plates of the top chords and inclined end posts measure 24 inches in width, 6 inches more than similar members on the short span. Similarly, the width of the vertical posts (measured across the

lacing) on the long span measures approximately 14 inches, 2 inches more than the vertical posts on the short span.

The top chord and inclined end posts are made of two built channels, a cover plate, and lacing underneath. The intermediate vertical posts consist of two laced channels (rolled). Engineers used punched eyebars for the bottom chords and the main diagonals that did not require stiffening. They placed loop-eye diagonAls (square cut) with turnbuckles with each panel, larger versions used in the center panels of each span.

The structures rests on roller nest expansion bearings. Each circular roller--not segmented or geared--has a groove approximately three inches in width, cut around the center. A corresponding rib attached to the bottom of the bolster plate prevents the shoe from sliding laterally off the rollers. The shoe is designed with the rollers exposed. The bolster plates sit on the rollers and appear to be identical to the plates, securing the truss directly to the masonry of the center pier. Lack of maintenance has contributed to deterioration. Both trusses have expanded, pushing the bolster plates to the back of the shoes. This shift has exposed between one and three rollers of each nest, causing some rollers to buckle. Although the shoes appear to be identical on both spans, the connection varies slightly, apparently adjusting to truss size. On the long span, the eyebars enter the shoes on the outside of the inclined end posts; on the short span, the eyebars enter the shoes on the inside of the inclined end posts.

Marinette and Menominee county highway officials report only minor maintenance on the structure since it came under their control. The surface of the bridge is heavily corroded. When engineers for Donohue & Associates inspected the structure in 1979, they estimated that rust and corrosion had caused a 10-15 percent loss of capacity in members throughout the bridge.

The Wisconsin & Michigan Railroad Bridge was a standard design used during the last half of the nineteenth century and into the twentieth century. During this time, many engineers considered the pin-connected Pratt through truss, with its vertical intermediate posts and inclined end posts, an effective railroad bridge form. It was not unusual for pin-connected spans of various designs to exceed 500 feet. By the late 1880s, one engineer estimated at least 2.5 miles of bridges had been built with spans exceeding 500 feet, with the vast majority measuring between 200 and 300 feet.[24]

In 1891, engineer J. A. L. Waddell recommended the Pratt truss as the best design for single-track spans more than 150 feet and double track spans more than 125 feet. Nearly 25 years later, he was still advocating the use of the Pratt truss for railroad bridges, but only with riveted connections.[25] Although Waddell was not directly connected with the Wisconsin & Michigan Railroad Bridge project, his recommendations for standardized bridge building practices were among the most widely published bring engineering reports during the turn of the twentieth century.

The Wisconsin & Michigan Railroad Bridge may be unique for the design of its top chord in relation to its length. The long span of the bridge exceeds 221 feet. By 1916, Waddell was recommending straight parallel top chords for spans up to 200 feet and polygonal top chords for longer spans. The maximum length, however, was flexible, depending ont the number of tracks and the weight of the trains.

Engineers believed inclining the top cord reduced the amount of metal required.[26] The bridge span is unusually long, compared to extant Pratt through truss highway bridges in Wisconsin; individual highway spans generally do not exceed 120 feet and none longer than 150 feet are known to exist currently.[27] With a roadway of 10.3 feet in width, the bridge may also be unusually narrow, even for a railroad bridge (assuming the roadway was modified only slightly when converted to highway use). In 1891, Waddell considered the average clear roadway for a single track through bridge to be 15 feet wide. He suggested increasing it to 16 feet to decrease the number of bridge accidents caused by derailment, the primary argument against pin-connected bridges.[28]

It is difficult to compare the Wisconsin & Michigan Railroad Bridge with other regional Pratt through railroad trusses because the departments of transportation in Michigan and Wisconsin have not included railroad bridges in their state surveys. In Wisconsin, there are only two other Pratt through trusses which were converted from railway to highway use. Both 162-foot spans are located on Shoreline Drive, spanning the Menominee River in Beecher Township, Marinette County, near Miscauno Island. The pin-connected trusses are similar, but not identical, to the Wisconsin & Michigan Railroad Bridge. The bridges consist of only three full panels instead of five, additional diagonal posts support the inclined end posts, and the overhead bracing has a different configuration. The comparison is noteworthy, however, because the Wisconsin & Michigan Railway Company acquired a logging railroad (built by William Holmes & Son) in 1904 or 1905, which extended into Wisconsin from Miscauno Island. The railway company connected the road to their main line, building and replacing several railway bridges.[29]

Engineering publications from the late nineteenth century often contain vague and conflicting information about recommended practices for railroad bridge building, but it appears that soon after the turn of the century, the use of pin-connected Pratt through trusses was beginning to fall out of favor. Fifteen years after the Wisconsin & Michigan Railroad Bridge was built, an engineer with the Missouri Pacific Railway ranked old bridges on their level of safety. He considered the deck plate girder the safest type to not overload, but "the pin-connected through truss occupies the bottom of the list on account of the greater danger from blows of derailed cars, and also because of the possible increase in wear at the joints."[30]

ENDNOTES

[1]*Standard Atlas of Marinette County, Wisconsin* (Chicago: Geo. A. Ogle & Co., 1912); *Standard Atlas of Menominee County, Michigan* (Chicago: Geo. A. Ogle & Co., 1912); Marinette County Abstract and Land Co., Map of Marinette County, Wisconsin, 1896.

[2]Marinette County Historical Society, *Marinette County Centennial, 1897-1978* (Marinette: Marinette County Historical Society, 1979), 7;*Marinette County, Wisconsin* (Chicago: Chicago, Milwaukee and St. Paul Railway, ca.1903); *The Ideal Farms of Marinette County, Wisconsin/Where Farmers Grow Rich* (Marintte: Skidmore Land Co., 1904).

[3]Roob Allie, "Upper Penninsula Railway History Dates to Mining," *Marinette Eagle Star*, 18 May 1938, 5; Julie Johnson, "The History of Menominee Now & Then," [Typewritten][n.p.], Spies Public Library, Menominee, Michigan, 14.

[4]"The New Bridge," *Peshtigo Times*, 5 April 1906, 1, col.6; "New County Bridges," *Peshtigo Times*, 30 August 1906, 1, col.4.

[5]"John Bagley, vice president...," *Menominee Journal*, 30 December 1893, 1, col.4.

[6]"The new bridge now...," *Menominee Journal*, 17 February 1894, 1, col.4; "The New W. & M. Bridge," *Weekly Eagle*, 17 March 1894, 8, col.4; "Progress on the New Railroad," *Weekly Eagle*, 31 March 1894, 8, col.2.

[7]"The W. & M. Railroad," *Menominee Democrat*, 7 April 1894, 1, col.6.

[8]"Railroad Rumblings," *Daily Eagle*, 24 April 1894, 2, col.3; "Feared for the Bridge," *Weekly Eagle*, 28 April 1894, 2, col.3.

[9]"Railroad Work," *Weekly Eagle*, 28 July 1894, 8, col.3; "Fernstrum & Fred...," *Menominee County Journal*, 8 September 1894, 1, col.4. For references to the temporary wooden bridge built in Peshtigo, see: "In the office...," *Peshtigo Times*, 2 February 1894, 10, col.3; "The New Bridge," *Peshtigo Times*, 16 February 1895, 1, col.5; "Two piers...," *Peshtigo Times*, 2 March 1895, 1, col.3; "The New Bridge," *Peshtigo Times*, 30 March 1895, 1, col.5; "W. & M. Notes," *Peshtigo Times*, 4 May 1895. For references to the construction of a permanent bridge built in Peshtigo, see: "Wis. & Mich. New Bridge," *Peshtigo Times*, 29 November 1906, 1, col.5; "The new steel bridge...," *Peshtigo times*, 28 February 1907, 5, col.3.

[10]"Frank Erickson...," *Menominee County Journal*, 1 September 1894, 8, col.2. For information about a McGinnis Construction Company, see: "History of Area Tied to Wisc-Mich. Railroad," *Peshtigo Times*, 9 July 1975, 13, col.1; *Lakeside Directory of Chicago*, vols. 1888-1895; Listings under Contractors-Bridges and McGinnis Construction Company, Corporation Department, Secretary of State, State of Illinois, Springfield.

[11]"Railroad Work," *Weekly Eagle*, 28 July 1894, 8, col.3.

[12]"The Wis. & Mich. track...," *Menominee County Journal*, 15 September 1894, 8, col.4; "Mason work...," *Menomine County Journal*, 29 September 1894, 8, col.2; "The Wis. and Mich. Bridge...," *Menominee County Journal*, 20 October 1894, 12, col.1.

[13]*Lakeside Directory of Chicago*, vols. 1888-1916, listings under F.S. Brown & Co., Frederick S. Brown, and Frank Ericksen.

[14]"Frank Steele...," *Menominee County Journal*, 11 August 1894, 8, col.2; *Lakeside Directory*, vols. 1893-1894, listings under Contractors, F.J. McCain Company, McCain, and Frank Steele.

[15]Mrs. Clarence Christopher, "History of Area Tied to Wis.-Mich. Railroad," *Peshtigo Times*, 9 July 1975, 1; "Narrow Gauge Operations," *Menominee Democrat*, 29 April 1893, 1, col.4; "The W.& M. Ry.," *Peshtigo Times*, 20 July 1895, 8, cols.2-3.

[16]"Logging by Rail," *Daily Eagle*, 27 October 1893, 3, col.4; "History of Area," *Peshtigo Times*, 9 July 1975, 13, col.2.

[17]Christopher, "History of Area," *Peshtigo Times*, 9 July 1975, 1; "The W. & M. Ry.," *Peshtigo Times*, 20 July 1895, 8, cols.2-3; Articles of Organization, Railroad Incorporations and Resolutions, vol. 8, p.496, Secretary of State Office, State of Wisconsin; "A New Railroad," *Menominee Democrat*, 21 October 1893, 2, col.2.

[18]"New Railway Company, " *Weekly Eagle*, 28 October 1893, 2, col.3.

[19]"With Two Seaboards," *Menominee Democrat*, 21 October 1893, 1, col.3;"The Rails To Be Laid," *Menominee Democrat*, 9 December 1893, 1, col. 5; Frederick G. Harrison, *Fading Glory* (Indian Rocks Beach, Florida: Books Unlimited, 1971), "Part One."

[20]*The Railroads of Wisconsin 1827-1937* (Boston: Railway & Locomotive Historical Society, 1937), 62; Harrison, *Fading Glory*, "Part One."

[21]Harrison, *Fading Glory*, p."Part One"; "Cities to ask Continuance," *Marinette Eagle-Star*, 21 May 1937, 3, col.1; "ICC Sanctions Abandonment Wisc. & Mich. Ry." *Marinette Eagle Star*, 20 January 1938, 1, col.5; "Last W-M Train Goes Out Today," *Marinette Eagle-Star*, 30 June 1938, 4, col.1.

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[23]Marinette County, *Proceedings*, 1937, p.117; "Start Soon to Salvage Rails," *Marinette Eagle-Star*, 22 July 1938, 5, col.1.

[24]Theodore Cooper, "American Railroad Bridges," American Society of Civil Engineers, *Transactions* 21 (July 1889): 17.

[25]J.A.L. Waddell, "Disputed Points in Railway Bridge Designing," *Engineering News* 26 (12 December 1891): 611; Cooper, "American Railroad Bridges," *Transactions*, 41; J.A.L. Waddell, *Bridge Engineering*, 2 vols., (New York: John Wiley & Sons, 1916), 2:1641.

[26]Waddell, *Bridge Engineering*, 1:479 and 2:1641; Waddell, "Disputed Points," *Engineering News*, 611.

[27]Robert Newbery (Madison, Wisconsin), staff historian, Wisconsin Department of Transportation, telephone interview by author, 27 April 1989. According to Newbery, there are records of one or two 190-foot Pratt truss highway spans, now replaced.

[28]Waddell, "Disputed Points," *Engineering News*, 611.

[29]Bridges P-38-0925 and P-38-0926, Bridge Section, Department of Transportation, State of Wisconsin; Ray Sauvey (Green Bay, Wisconsin), general manager, National Roadroad Museum, correspondence with author, 5 October 1889. Other railway bridges built over the Menominee River included: 1) a four-span lattice truss built in Marinette-Menominee by the Chicago & Northwestern Railway prior to 1904, and 2) a 255-foot Pratt deck span built near Iron Mountain, Michigan, by the Chicago, Milwaukee & St. Paul Railway in 1885, 3) replaced in 1902 with a 207-foot span consisting of two arched deck trusses. See: Edward E. Payne, *A Souvenir of Marinette County* (Iron Mountain, Michigan: C.O. Stiles, 1904); "Three-Hinged Steel Arch Bridge; Chicago, Milwaukee & St. Paul Ry.," *Engineering News* 21 (20 November 1902): 418-419. A single span Pratt truss railroad bridge built in Belleville, Dane County, Wisconsin, in 1888 was determined eligible for the National Register in 1977.

[30]M.L. Byers, "Weak Points in Old Railway Bridges," *Engineering News* 62 (18 November 1909): 550.

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Photocopy of historic photograph of railroad or lumber workers with barrel view of bridge in background. Undated. Image made by local amateur photographer John Hallfrisch, part of a series taken of the village of Koss, Michigan. Glass negative

in private collection of Frank Bayee, Stephenson, Michigan.

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Photocopy of post card of Wisconsin & Michigan locomotive with lumber-loaded cars traveling south across the Wisconsin & Michigan Railroad Bridge. In private collection of Ray Sauvey, Green Bay, Wisconsin.

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Menominee (Mich.) *Democrat*. 1 April 1893-1 December 1894.

Menominee (Mich.)*Journal*. October 1893-July 1894.

Peshtigo (Wisc.) *Times*. 3 November 1894-18 January 1896. 15 March 1906-January 1908.

APPENDIX

Data Pages:

19. Map. Marinette County, Wisconsin. 1986. Department of Transportation. State of Wisconsin.

20. Map. Marinette County, Wisconsin. 1896. Marinette County Abstract and Land Co. (State Historical Society of Wisconsin-Archive H/GX9028/M33/1896/M).

21. Map. Menominee County, Michigan. 1912. *Standard Atlas of Menominee County* (Chicago: Geo. A. Ogle & Co., 1912).

22. Map. Wisconsin and Michigan Railway. n.d. Illustrated in Frederick G. Harrison, *Fading Glory* (Indian Rocks Beach, Florida: Books Unlimited, 1971).

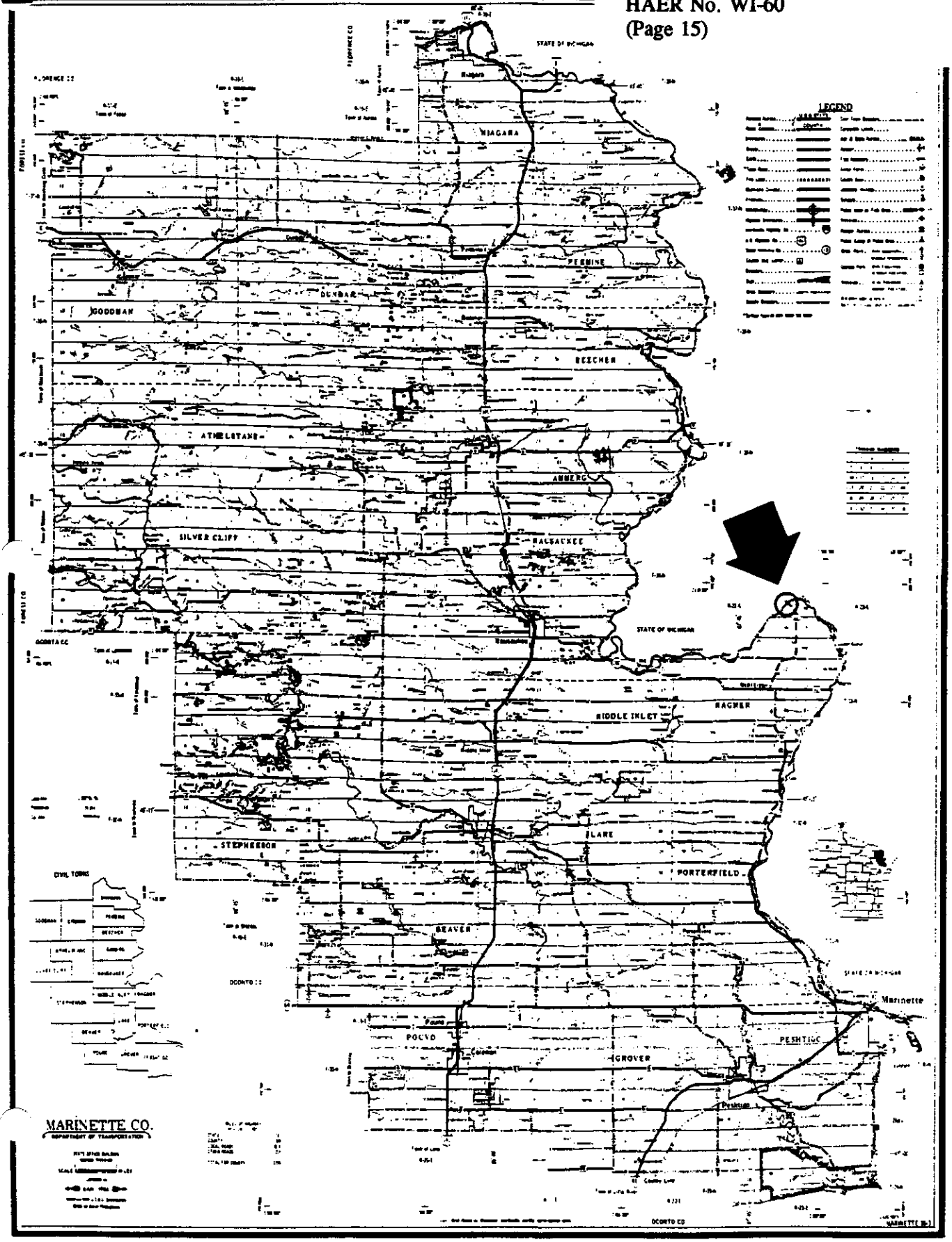
23. Map/Flyer. Wisconsin & Michigan Railroad. n.d. Rand McNally & Co. Illustrated in Harrison, *Fading Glory* (1971).

24. Photocopy of historic photograph of railroad or lumber workers with barrel view of bridge in background. Undated. Image made by local amateur photographer John Hallfrisch, part of a series taken of the village of Koss, Michigan. Glass negative in private collection of Frank Bayee, Stephenson, Michigan.

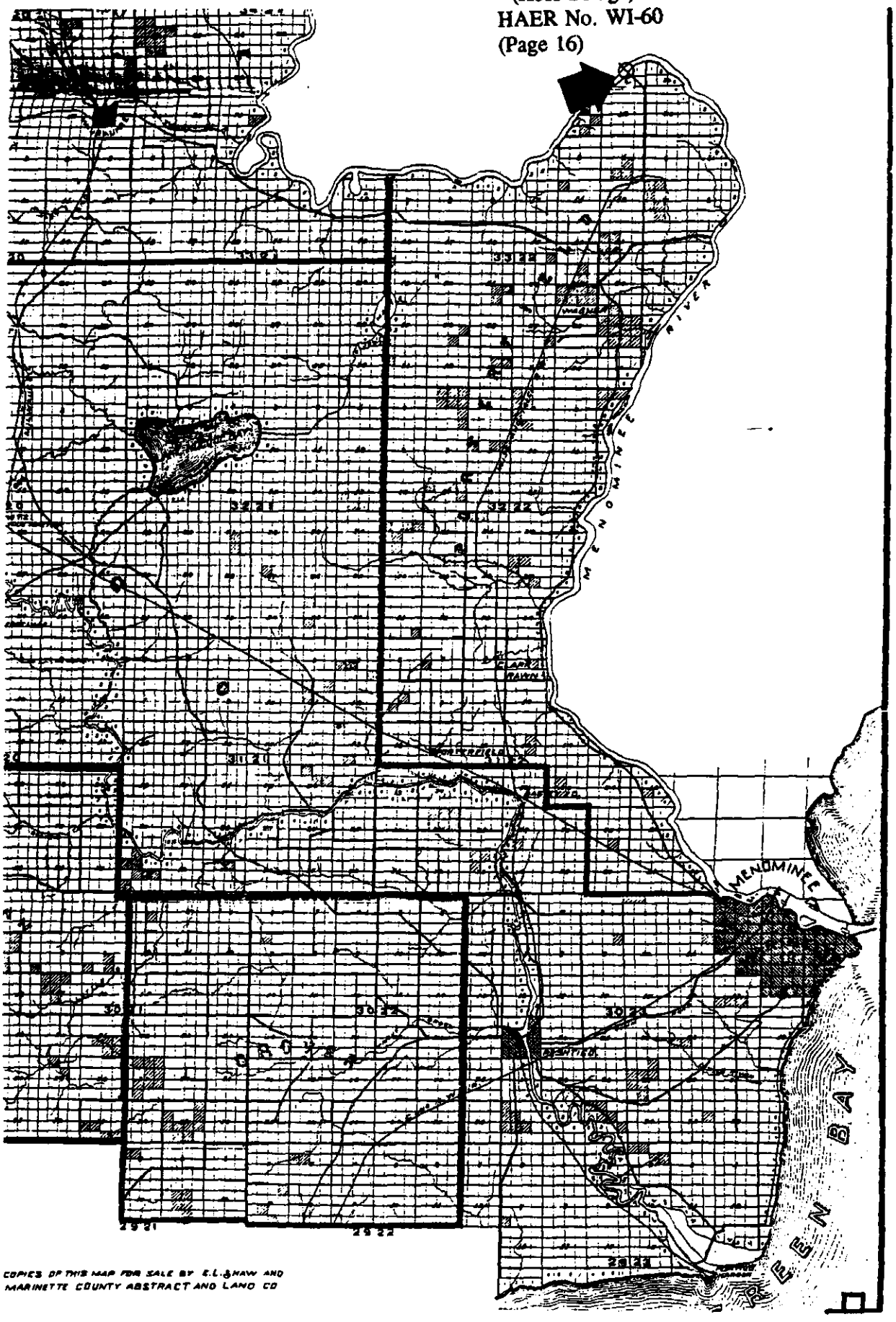
25. Photocopy of post card of Wisconsin & Michigan Locomotive #605 with lumber-loaded cars traveling south across the Wisconsin & Michigan Railroad Bridge. ca.1910. Caption: W & M Logging Train Crossing Menominee...Koss Mich. In private collection of Ray Sauvey, Green Bay, Wisconsin. According to Sauvey, the Wisconsin & Michigan Railway Company acquired this locomotive in August 1906.

26-38. Bridge Inspection Report. Donohue & Associates, Inc. (Sheboygan, Wisconsin). Project No. 40054.6. (30 August 1979).

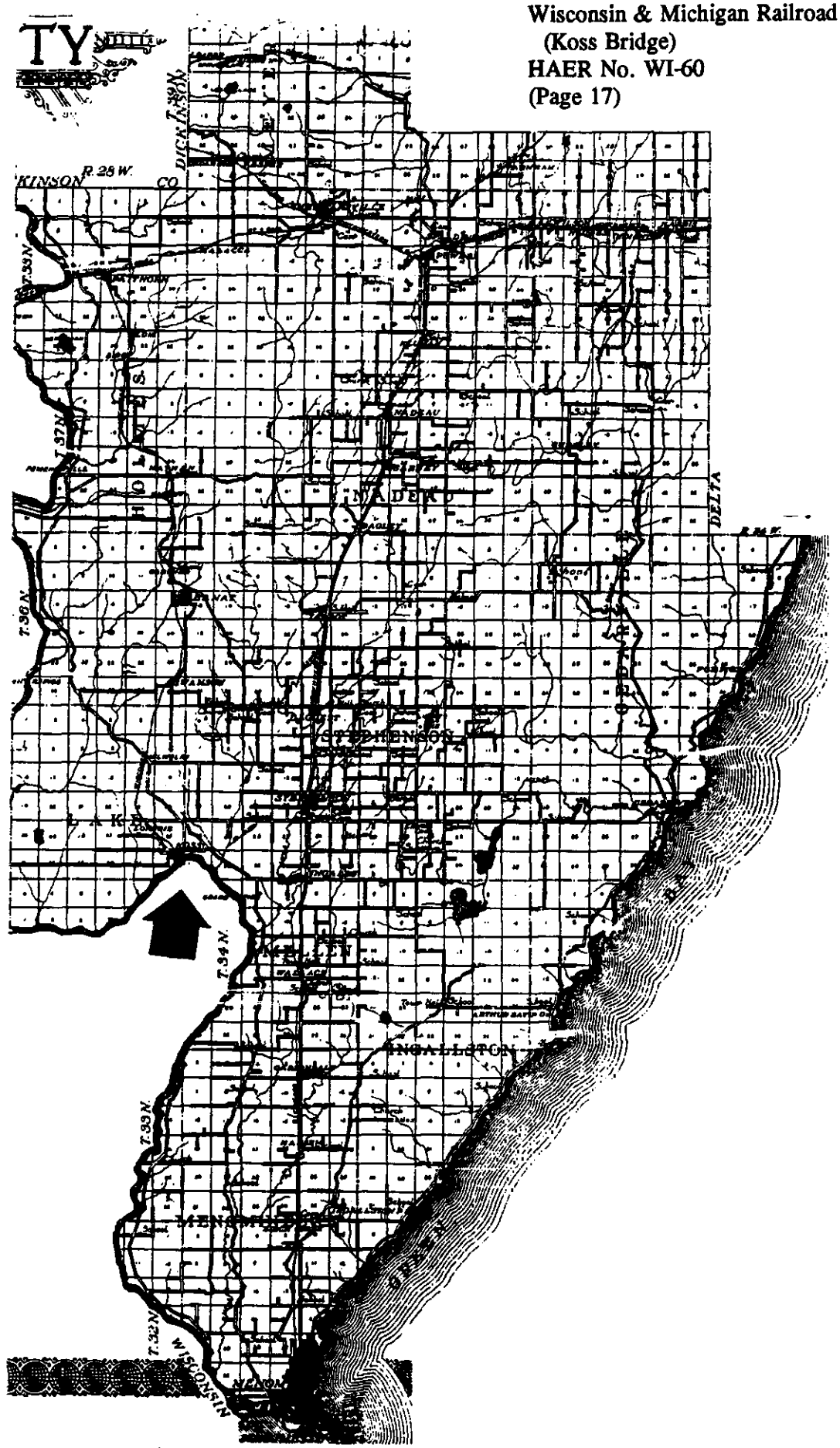
Wisconsin & Michigan Railroad Bridge
(Koss Bridge)
HAER No. WI-60
(Page 15)

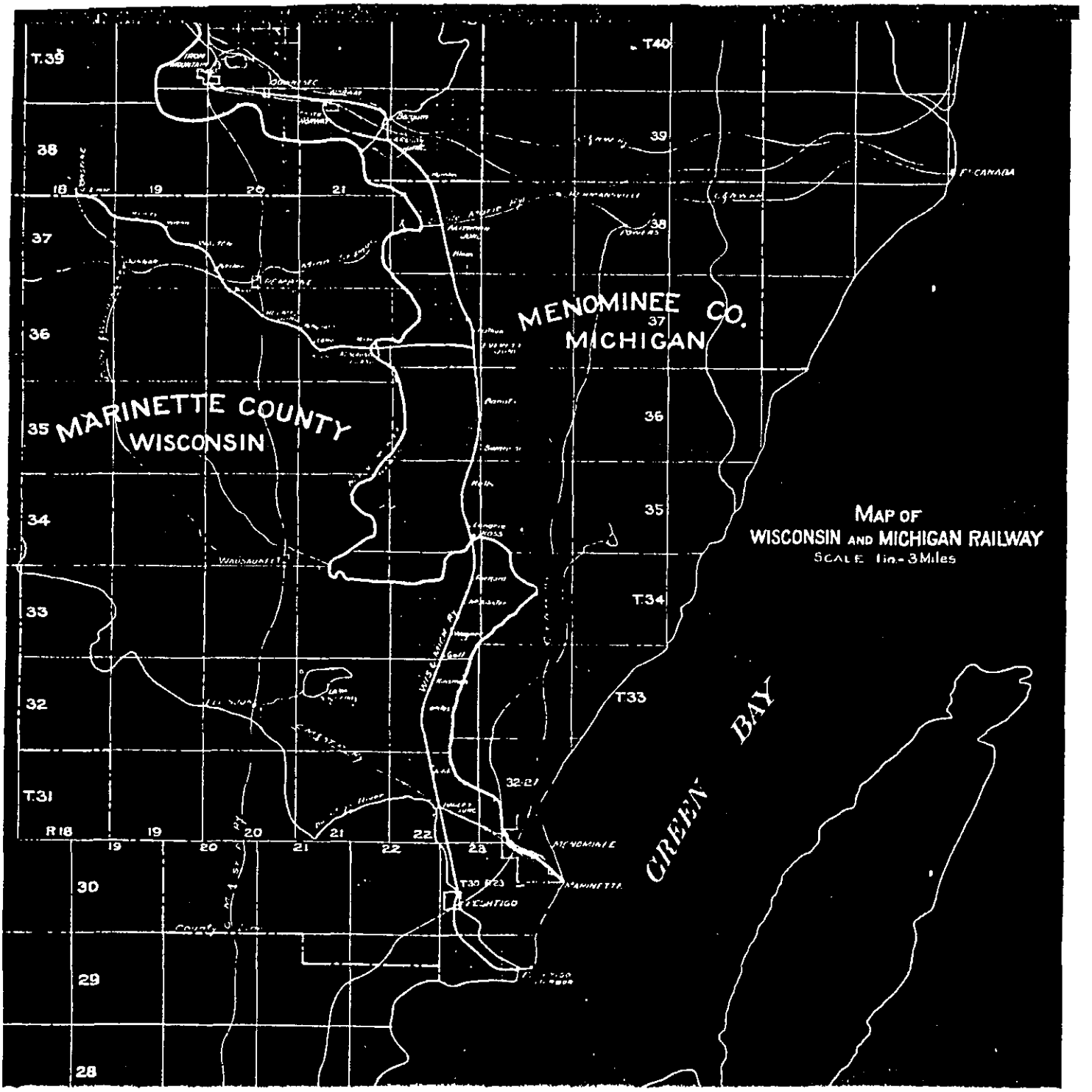


Wisconsin & Michigan Railroad Bridge
(Koss Bridge)
HAER No. WI-60
(Page 16)



Wisconsin & Michigan Railroad Bridge
(Koss Bridge)
HAER No. WI-60
(Page 17)




MENOMINEE CO.
MICHIGAN
MARINETTE COUNTY
WISCONSIN
MAP OF
WISCONSIN AND MICHIGAN RAILWAY
SCALE 1in=3Miles
GREEN BAY
T.39
T40
T34
T33
T31
R18
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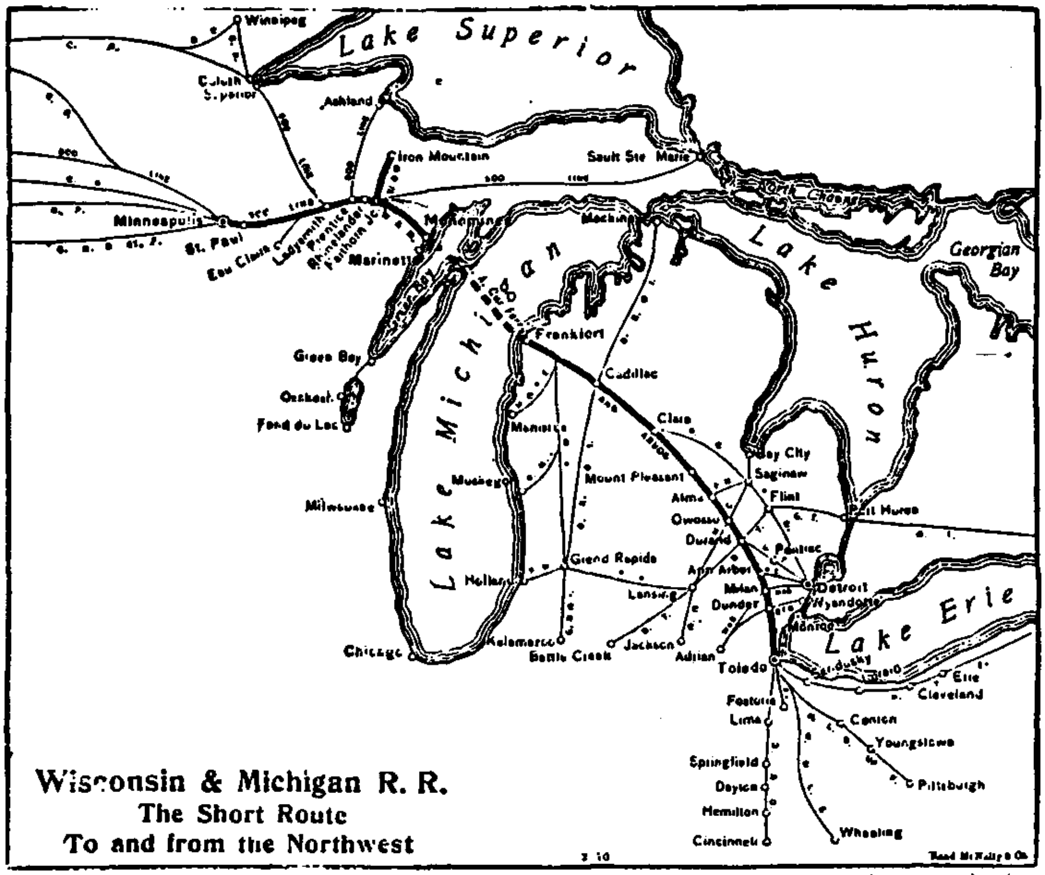
1056

WISCONSIN & MICHIGAN RAILROAD



WISCONSIN & MICHIGAN RAILROAD COMPANY.

Chicago Address - 1307 Wrightwood Avenue.

JOHN MARSCH, President, 1307 Wrightwood Ave., Chicago, Ill.
W. H. WRIGHT, Vice-President and General Manager, Menominee, Mich.
NICOLAS MARSCH, Secretary and Treasurer, 1307 Wrightwood Avenue, Chicago, Ill.
A. H. HAYES, Assistant Treasurer and Purchasing Agent, Menominee, Mich.
W. A. AHERN, Auditor, "
G. H. MacLEOD, Assistant Auditor, "
H. N. BRECKHEIMER, General Freight and Passenger Agt., Menominee, Mich.
H. D. MITCHELL, Assistant General Manager, "
J. GAUTHIER, Superintendent and Master Mechanic, "
A. WALDBAUER, General Eastern Agent, 520 Park Building, Pittsburgh, Pa.
T. W. WILLIAMS, Commercial Agt., " "
WM. H. McCLOUD, General Agent, 3-223 General Motors Building, Detroit, Mich.
W. P. TEEGARDIN, General Agent, 1148 Henry Building, Seattle, Wash.
L. B. EELZ, General Agent, Room 501, Maritime Exchange, 79 Broad Street, New York, N.Y.
C. E. DUNCAN, General Agent, Room 207, 309 South La Salle St., Chicago, Ill.
ERNEST IRBER, General Agent, 316 Corn Exchange Building, Minneapolis, Minn.
S. E. TOUCEY, General Agent, Room 626, New Board of Trade Building, Kansas City, Mo.
P. C. HEDLUND, Commercial Agent, Iron Mountain, Mich.
P. M. CRAWFORD, Commercial Agent, 204 Lincoln Building, Spokane, Wash.
C. F. WOOD, [illegible] Agent, 205 Hippodrome Bldg, Cleveland, O.
ALVIN RO[illegible], Commercial Agent, 301 Bell Block, Cincinnati, O.

No. 2	Mls	January, 1917	Mls	No. 1
Operated for Freight Only.		LEAVE ARRIVE		Operated for Freight Only.
	0	Iron Mountain	70.5	
	4.3	Quinnesec	66.3	
	8.2	Norway	62.3	
	13.0	Loretto	57.8	
[illegible] A M	20.8	Faithorn Junc. △	49.7	6 15 P M
6 15 *	29.0	Nathan	41.6	5 46 *
6 [illegible] *	30.1	[illegible]	40.7	5 43 *
6 41 *	33.3	Banat	37.2	5 28 *
6 51 *	35.2	Swanson	35.0	5 23 *
— —	37.7	Longrie	32.8	— —
7 16 *	43.1	Koss	27.4	5 02 *
— —	45.7	Packard	24.8	— —
7 46 *	48.0	McAllister	22.5	4 50 *
7 34 *	50.1	Wagner	20.4	4 44 *
7 37 *	51.7	Gill	18.8	4 40 *
7 50 *	55.2	Miler	15.3	4 31 *
8 03 *	59.1	Walsh	11.4	4 19 *
8 10 *	62.0 arr.	Bagley Junc.	lve. 8.5	4 10 *
8 40 *	65.0 lve.	Bagley Junc.	arr. 5.5	4 05 *
8 [illegible] *	68.7	Marinette △	1.8	3 45 *
8 50 A M	70.5	Menominee △	0	*3 30 P M
		ARRIVE LEAVE		

* Daily. + Coupon stations; △ Telegraph stations.
Standard—Central time.

CONNECTIONS.

At Iron Mountain—With Chicago, Milwaukee & St. Paul Ry. and Chicago & Northwestern Ry.
At Faithorn Junction—With Minneapolis, St. Paul & Sault Ste. Marie Ry. for all points east and west.
At Bagley Junction—With Chicago, Milwaukee & St. Paul Ry. for all points north and south.
At Marinette—With Chicago, Milwaukee & St. Paul Ry. and Chicago & Northwestern Ry. for all points north and south.
At Menominee—With Chicago, Milwaukee & St. Paul Ry., Chicago & Northwestern Ry. and Ann Arbor R. R. for all points east and southeast.

DONOHUE & ASSOCIATES, INC.
CONSULTING ENGINEERS
SHEBOYGAN, WISCONSIN

CLIENT DOT
PROJECT P-38-905 BY JTT
PROJECT NO. 4054.6 PAGE NO.

Span 1

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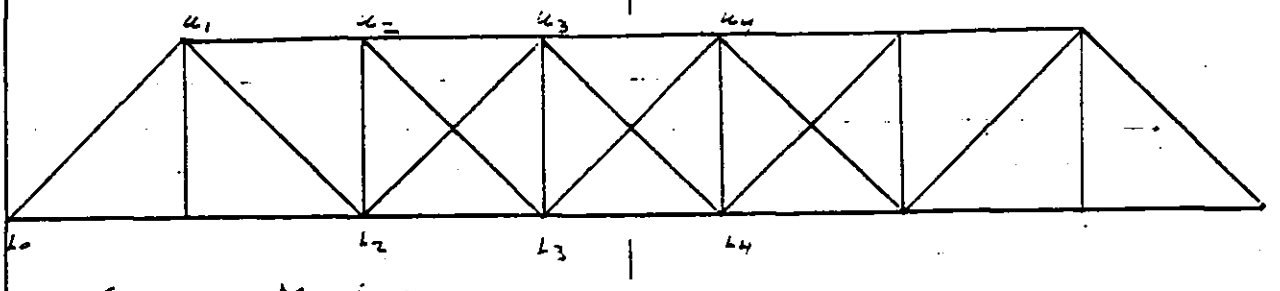

Governing Member

Design : HS 44
L2-U3 Inventory : HS 42 10% Loss of Section.
Operating : HS 49

Truss Rating

Member	Inventory	Operating
L0-L2	H 63	HS 95
L0-U1	H 108	HS 138
L2-L3	H 55	HS 83
L2-U3	H 56	HS 49
L3-L4	H 63	HS 95
L3-U4	H 51	HS 58
U1-L1	H 90	HS 106
U1-L2	H 54	HS 80
U1-U2	H 122	HS 155
U2-L2	H 85	HS 101
U2-L3	H 59	HS 79
U2-U3	H 98	HS 125
U3-L3	H 135	HS 140
U3-L4	H 51	HS 58
U3-U4	H 98	HS 125

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SHEBOYGAN, WISCONSIN

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PROJECT NO. 40054.6 PAGE NO.

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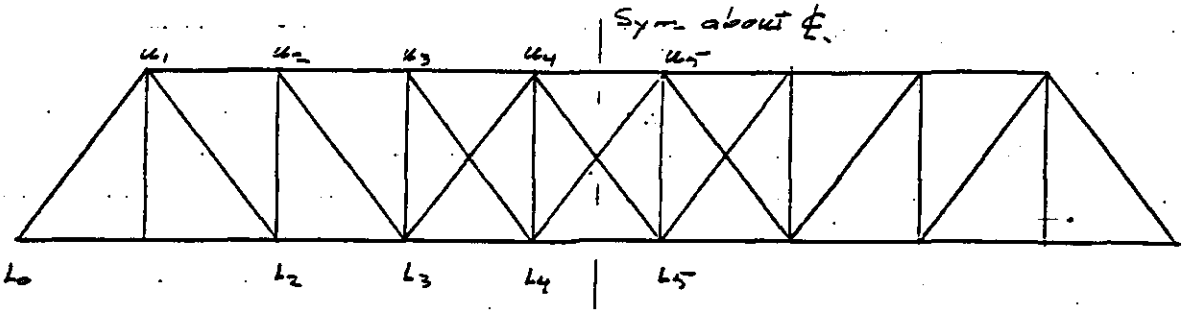

Governing Member

L3-U4 Design: HS28
Inventory: HS 27 10% Loss
Operating: HS 32

Truss Rating

Member	Rating Inventory	Rating Operating
L0-L2	H116	HS164
L0-U1	H110	HS138
L2-L3	H33	HS51
L3-L4	H85	HS121
L3-U4	H32	HS 32
L4-L5	H90	HS128
L0-U5	H67	HS86
U1-L1	H65	HS76
U1-L2	H77	HS110
U1-U2	H106	HS134
U2-L2	H125	HS157
U2-L3	H68	HS97
U2-U3	H79	HS101
U3-L3	H82	HS104
U3-L4	H71	HS100
U3-U4	H69	HS89
U4-L4	H115	HS135
	H117	HS91

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SHEBOYGAN, WISCONSIN

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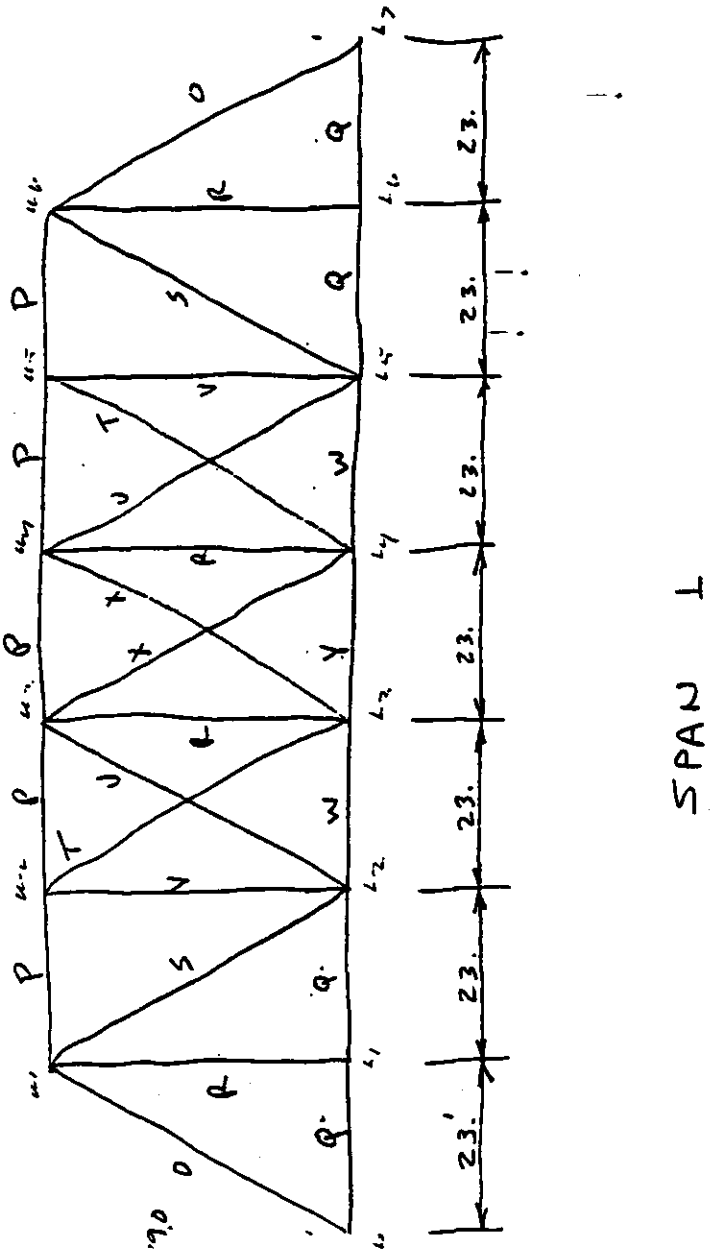
PROJECT NO. 4005-4.6 PAGE NO. _____

Year 1900 ±

This bridge was orginally for rail traffic.



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SHEBOYGAN, WISCONSIN

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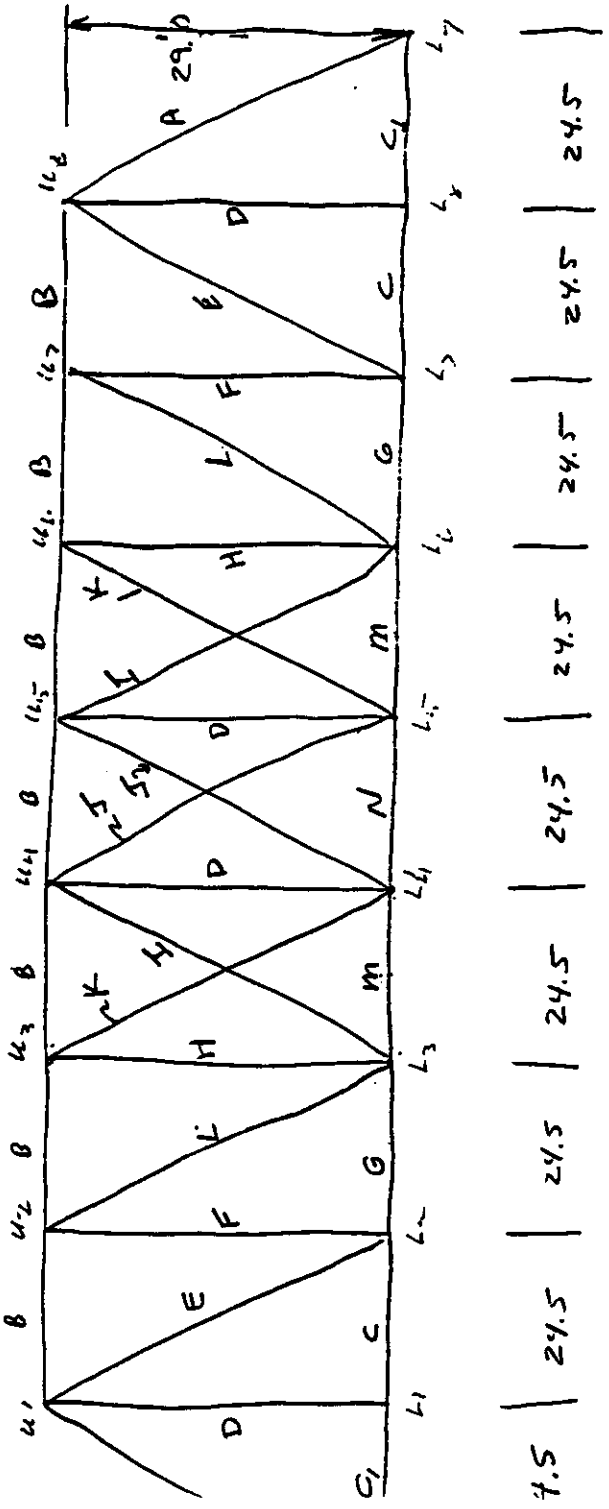

SPAN 2

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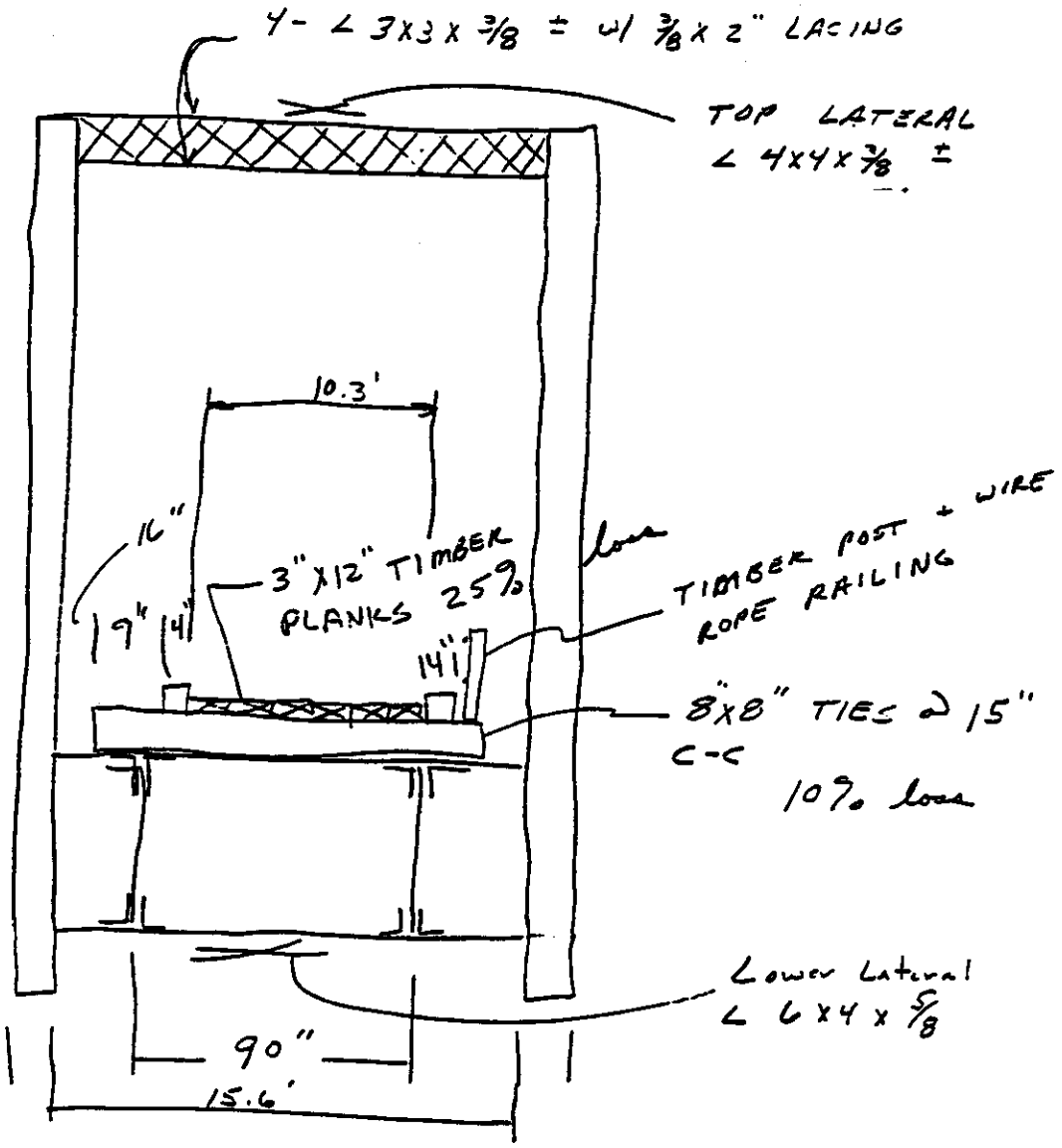

TYPICAL SECTION LOOKING NORTH

JNOHUE & ASSOCIATES, INC.
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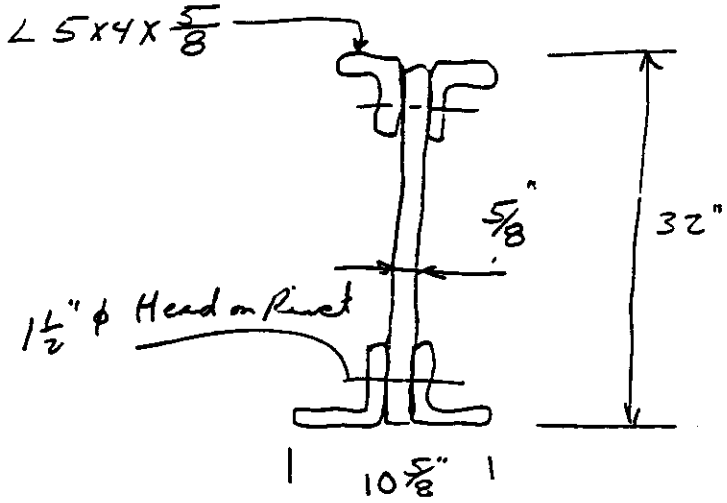
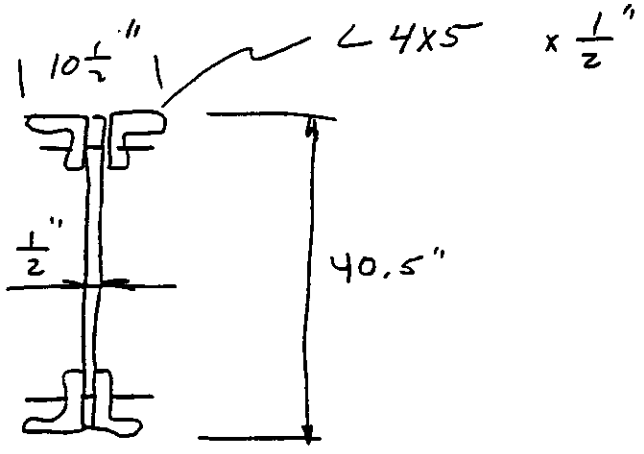


Stringers TYP BOTH SPANS
15% loss



Floor Beam TYP BOTH SPANS
15% loss

JNOHUE & ASSOCIATES, INC.
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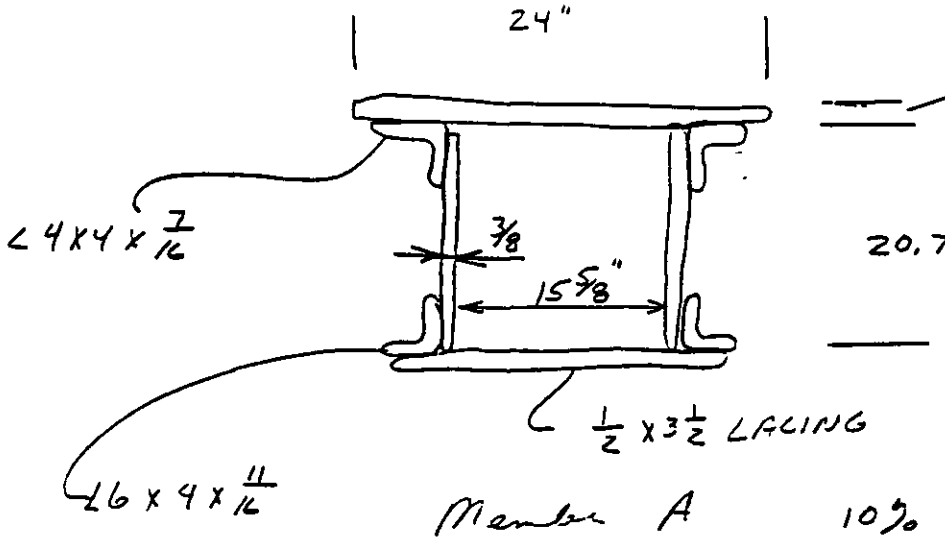

42.91 in²
- 10% Loss
38.61 in² gross
32.76 in²/FT.

Member A 10% loss -

same as A

Member B 10% loss

DONOHUE & ASSOCIATES, INC.
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CLIENT _____
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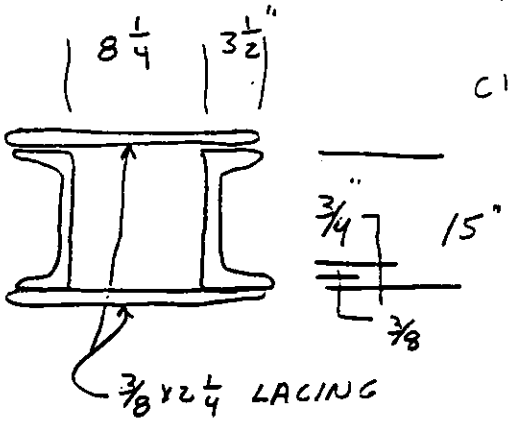
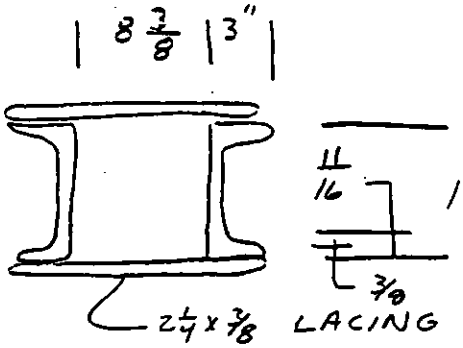


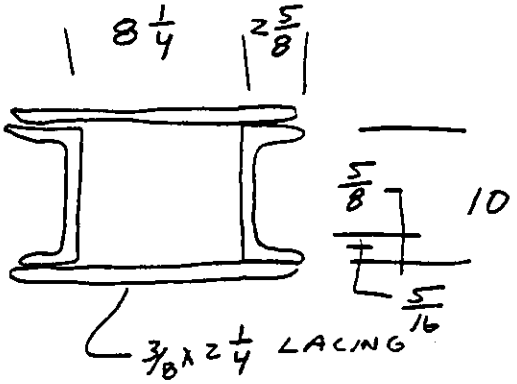
C15 x 40.0
23.6 in²
-10% Less
21.24 in² Gross
19.49 in² Net

Member F 10% loss



C12 x 20.7
12.15 in²
-10% Less
10.96 in² Gross
9.609 in² Net

Member H 10% loss



C10 x 15.3
8.98 in²
-10% Less
8.082 in² Gross
6.905 in² Net

Member D 10% loss

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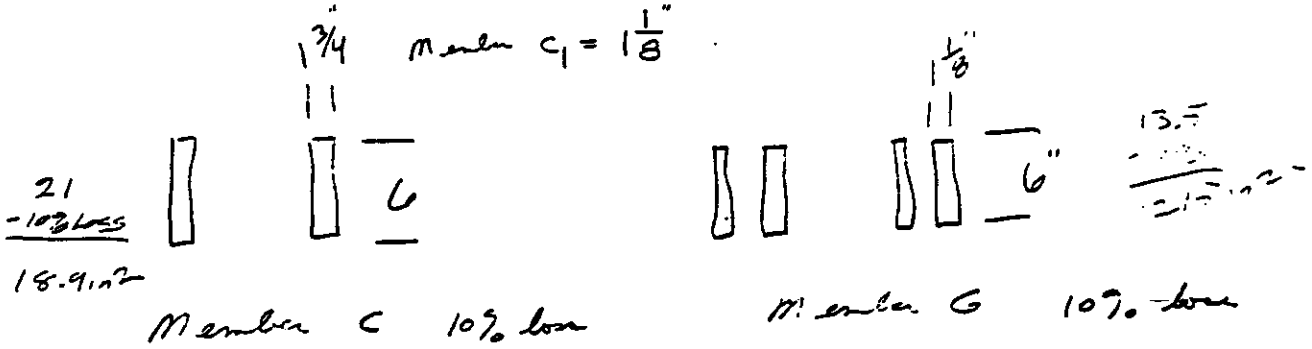

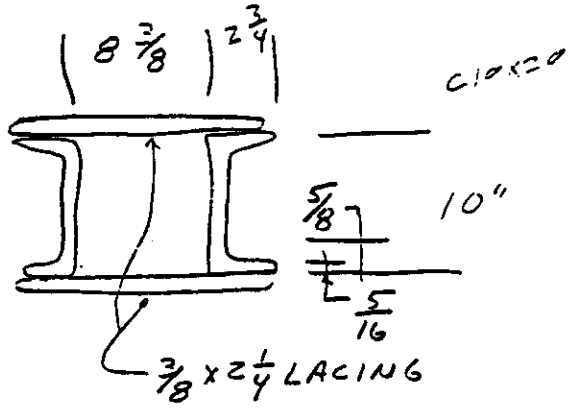

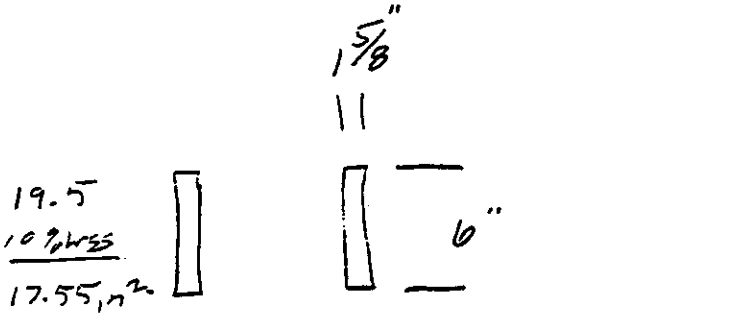

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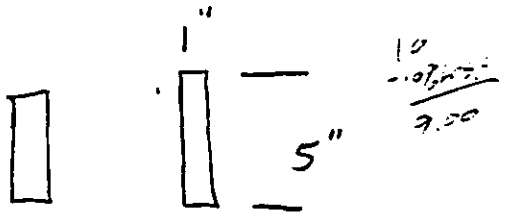
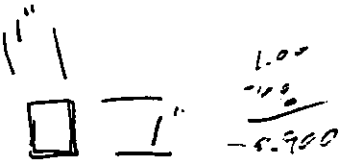
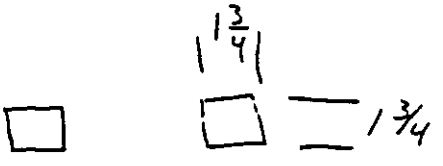


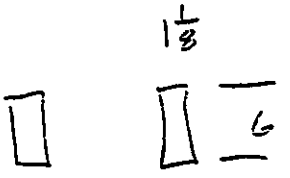
Member K 10% loss



Member I 10% loss

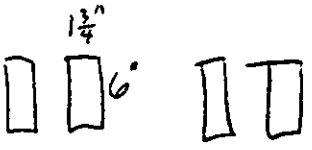


Member J 10% loss



Member L 10% loss

Member M 10% loss



Member N 10% loss

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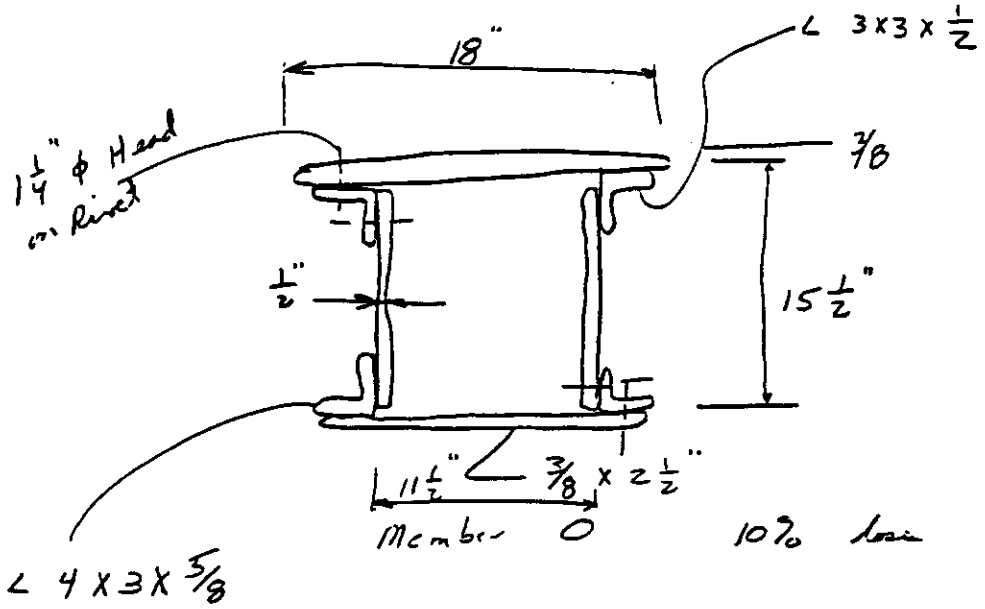
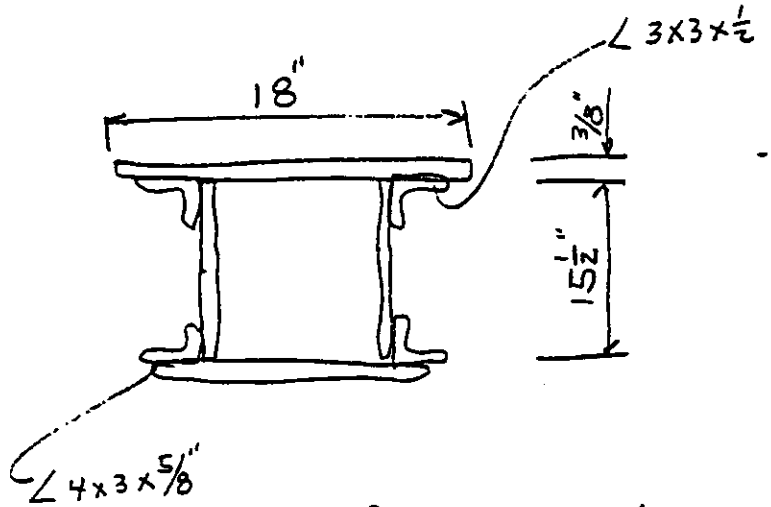


Member O 10% loss



35.71 in²
- 10% loss
32.14 in² Gross
25.60 in², V-T.

Mark P 10% loss

DIA. = 1 1/8" x 5"
HORIZ. = 1" x 5"

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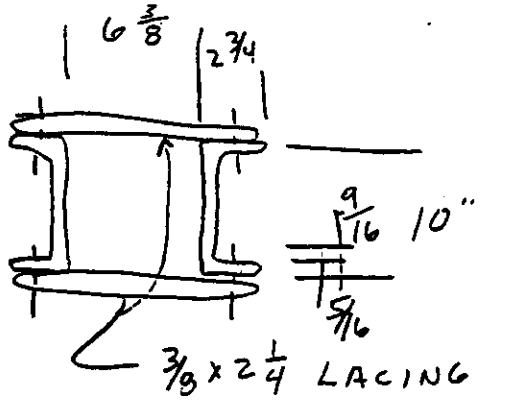
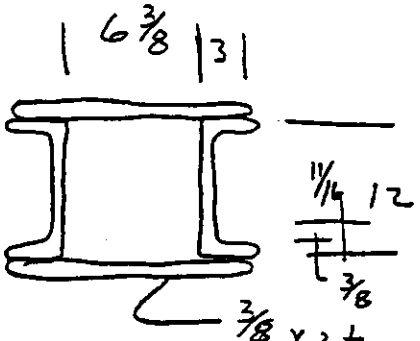


11.76 in²
-10% less
10.58 in² Gross
9.409 in² Net

Member R 10% loss

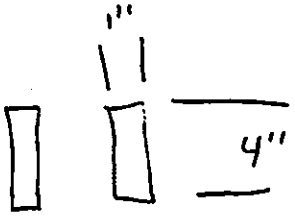


12.18
-10% less
10.96 in² Gross
9.409 in² Net

Member V 10% loss

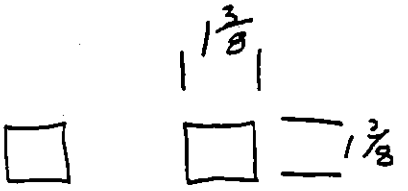
1.0
-10% less
0.9 in²

Member U 10% loss



8.00
-10% less
7.21 in²

Member T 10% loss



Member X 10% loss

3.781
-10%
3.403 in²

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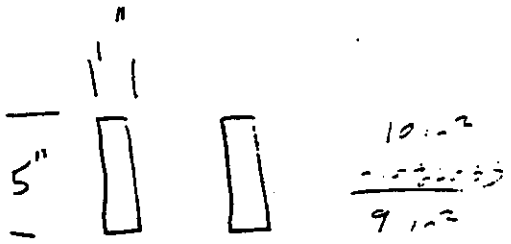
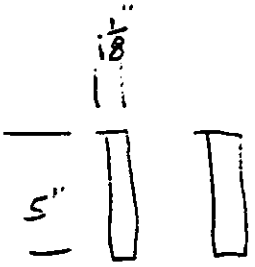


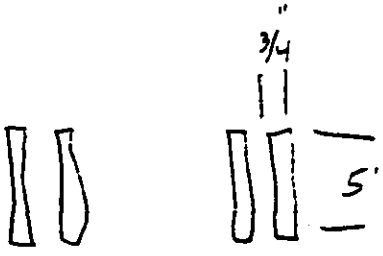
10 in²
- [illegible]
9 in²

Make 9 10% loss



11.25 in²
- [illegible]
10.13 in²

Make S 10% loss



15 in²
- [illegible]
13.5 in²

Make W 10% loss

20 in²
- [illegible]
18 in²